```
=> d his
     (FILE 'USPAT' ENTERED AT 14:28:09 ON 26 NOV 1997)
                ACT K5D26/L
               ---------
L1   (    247173)SEA FILE=USPAT MONITOR?
L2   (    848972)SEA FILE=USPAT CONNECTION?
L3   (     23653)SEA FILE=USPAT MONITOR? (P) CONNECTION?
L4   (       347)SEA FILE=USPAT CONNECTIONLESS
L5   (       789)SEA FILE=USPAT INTERNET
L6   (        36)SEA FILE=USPAT L3 (P) (CONNECTIONLESS OR INTERNET)
L7   (     66878)SEA FILE=USPAT PRINTER#
L8   (       347)SEA FILE=USPAT CONNECTIONLESS
L9   (         2)SEA FILE=USPAT PRINTER# (P) CONNECTIONLESS
L10  (     66878)SEA FILE=USPAT PRINTER#
L11  (     68911)SEA FILE=USPAT STATUS##
L12  (     47501)SEA FILE=USPAT REQUEST#
L13  (       349)SEA FILE=USPAT PRINTER# (P) STATUS## (P) REQUEST#
L14  (    247173)SEA FILE=USPAT MONITOR?
L15  (       238)SEA FILE=USPAT L13 AND MONITOR?
L16  (       789)SEA FILE=USPAT INTERNET
L17  (    848972)SEA FILE=USPAT CONNECTION?
L18  (        16)SEA FILE=USPAT L15 AND INTERNET AND CONNECTION?
L19  (    247173)SEA FILE=USPAT MONITOR?
L20  (        16)SEA FILE=USPAT L18 AND MONITOR?
               ---------
L21           16 S L20
L22           36 S L6
=>
```

=> d 122 10 12 16 32 date kwic

L22: 10 of 36

TITLE: Connectionless information service delivery
US PAT NO: 5,579,314 DATE ISSUED: Nov. 26, 1996
[IMAGE AVAILABLE]
APPL-NO: 08/431,786 DATE FILED: May 1, 1995
FRN-PR. NO: 9408798 FRN FILED: May 4, 1994
FRN-PR. CO: United Kingdom

ABSTRACT:
A telecommunications system has subscriber and/or private automatic branch exchange accesses, an access signalling system, and a **connectionless** network signalling system. The telecommunications system employs a **connectionless** signalling interworking unit for controlling the access signalling system remotely from the accesses. The unit is operative for interworking the network signalling system and the access signalling system. The unit includes a transaction control and transaction **monitoring** function for passing information bi-directionally between network points without establishing a bearer **connection** between the network points.

SUMMARY:

BSUM(9)

According to the present invention there is provided a telecommunications system having subscriber and/or Private Automatic Branch Exchange (PABX) accesses and **connectionless** network signalling, wherein the access signalling is controlled remotely using a **Connectionless** Signalling Interworking Unit which interworks the network and access signalling systems by providing a transaction control and **monitoring** function whereby information is passed in either direction without establishment of a bearer **connection**.

DETDESC:

DETD(2)

The proposal is that each telecommunications system of a telecommunications network having subscriber accesses be equipped with a **Connectionless** Signalling Interworking Unit (CSIU). The function of the CSIU is to interwork the network and access signalling systems by providing a transaction control and **monitoring** function (which is akin to the traditional call control function when bearer **connections** are considered) so that information may be passed in either direction without the pre-requisite of a bearer **connection**. This proposal does not preclude bi-directional information transfer in the presence of a bearer **connection**. This proposal is also applicable to Private Automatic Branch Exchange (PABX) access signalling.

DETDESC:

DETD(5)

A . . . a specific CSIU could be the control by the IN of a Bellcore ACMS telephone. In this example the IN **connectionless** signalling

would utilise Intemational Consultative Committee for Telecommunication and Telegraphy (CCITT) Number 7 signalling Transaction Capability (TC) Recommendations Q.771-775 conveyed via the Signalling **Connection** Control Part (SCCP) Recommendation Q.771-716 class 1 **connectionless** (CL) service, as illustrated by FIG. 2. The CSIU would perform a Transaction Control and **Monitoring** function and perform interworking to the Bellcore Analogue Display Subscriber Interface (ADSI) protocol. The CSIU would pass on the information. . . .

CLAIMS:

CLMS(1)

I claim:

1. A telecommunications system having subscriber and/or private automatic branch exchange accesses, an access signalling system, and a **connectionless** network signalling system, said telecommunications system comprising:

a **connectionless** signalling interworking unit for controlling the access signalling system remotely from said accesses, and operative for interworking the network signalling system and the access signalling system, said unit including a transaction control and transaction **monitoring** means for passing information bi-directionally between network points without establishing a bearer **connection** between the network points.

L22: 12 of 36

TITLE:	Subscriber information processing method in a connectionless data service		
US PAT NO:	5,561,662 [IMAGE AVAILABLE]	DATE ISSUED:	Oct. 1, 1996
APPL-NO:	08/210,149	DATE FILED:	Mar. 17, 1994
FRN-PR. NO:	5-233461	FRN FILED:	Sep. 20, 1993
FRN-PR. CO:	Japan		

SUMMARY:

BSUM(18)

In a broadband **connectionless** data service such as an SMDS, etc., in addition to the above described normal cell transmission process, the function of **monitoring** the traffic state such as occurrences of errors, the frequency of errors, etc. must be necessarily performed by **monitoring** a lot of subscriber information (referred to as network parameters).

SUMMARY:

BSUM(22)

Furthermore, in a broadband **connectionless** data service such as an SMDS, etc., a process referred to as a special study is also required. In this process, specified subscriber information is **monitored** at a subscriber's request or to, according to a network provider, establish a network for future use or **monitor** the state of a route in which a problem will possibly occur. Each piece of subscriber information is **monitored** at predetermined intervals in the performance

monitoring process and the network data collecting process, whereas an operator-inputted command controls the special study process according to the necessity. . .

SUMMARY:

BSUM(26)

On the other hand, a broadband **connectionless** data service such as an SMDS, etc. also requires an accounting process for each subscriber in addition to the **monitoring** process for a network parameter.

SUMMARY:

BSUM(33)

That . . . the present invention, a subscriber information processing system comprises a switch interface unit, provided in each station which performs a **connectionless** data process and connected as an optional external unit to a highway to which a subscriber information processing unit for. . . selectively receiving a cell assigned a predetermined source or destination address from among cells inputted through the highway; and a **monitor** unit for performing a **monitoring** process on predetermined subscriber information in a cell inputted from the switch interface unit according to a predetermined instruction.

CLAIMS:

CLMS(1)

What is claimed is:

1. A subscriber information processing system in a **connectionless** data service, comprising:
a **connectionless** data processing station connected to a highway;
switch interface means, provided to said **connectionless** data processing station and disconnectably-connected thereto as an external unit via said highway;
a subscriber information processing unit for processing subscriber. . . being controlled to enter cells corresponding to predetermined source addresses or predetermined destination addresses from among cells entered by the highway;
monitor means, provided to the **connectionless** data processing station and being coupled to said switch interface means, for **monitoring** predetermined subscriber information in the cells entered by said switch interface means according to a predetermined instruction;
a control unit; and
control system interface means, provided to the **connectionless** data processing station and being coupled between said control unit and said **monitor** means and said switch interface means, for communicating control information between said control unit and said **monitor** means and said switch interface means to control said **monitor** means and said switch interface means.

L22: 16 of 36

TITLE: Fast network file system running over a hybrid connectionless transport

US PAT NO: 5,526,483 DATE ISSUED: Jun. 11, 1996
[IMAGE AVAILABLE]
APPL-NO: 08/352,264 DATE FILED: Dec. 7, 1994
REL-US-DATA: Continuation of Ser. No. 956,715, Oct. 5, 1992, abandoned.

ABSTRACT:
A session-oriented network application dependent on reliable transport of messages on a first system communicates in a new form of **connectionless**, session-oriented communication called Sideband over a network with a second similar application on a second system. Sideband transport is not. . . system if received twice due to retry of an apparently lost message should not be sent Sideband. The LAN application **monitors** the responses from the second system to determine whether any messages sent Sideband were lost. In the event of a. . .

L22: 32 of 36

TITLE: Communications network arranged to transport connection oriented and connectionless messages
US PAT NO: 5,163,045 DATE ISSUED: Nov. 10, 1992
[IMAGE AVAILABLE]
APPL-NO: 07/591,182 DATE FILED: Oct. 1, 1990

SUMMARY:

BSUM(9)

In particular, in addition to its unique module transmit/receive address (i.e., the primary address) for **connection**-oriented service, each module which also participates in **connectionless** message service is assigned, in accordance with an aspect of the invention, a common receive (secondary) address, which has a unique value and which is reserved for the transmission of **connectionless** messages. When a source transmits over the common transmission medium, or broadcast bus, a **connectionless** message the source inserts in a predefined identifier field its unique transmit address and its reserved channel number. The associated. . . field, (c) and places the modified message onto the common broadcast bus. In addition, each module which participates in the **connectionless** message service **monitors** the broadcast bus for messages whose identifier field contain either the module's unique primary address or common secondary address. In this way, each such module accepts from the common broadcast bus either a **connectionless** message containing the common secondary address or a **connection** oriented message containing its respective unique primary address.

DETDESC:

DETD(31)

Accordingly, switch module 125 translates the VCI field of the **connectionless** message segment that it receives from transmitter 40-15 into the common address and address of module 110-4, and then places the message on broadcast bus 135. Those modules which participate in **connectionless** message service **monitor** the bus for messages which not only bear their respective primary module addresses, i.e., CONS messages, but which also bear. . .

DETDESC:

DETD(33)

In particular, bus receiver circuits 50-1 and 50-2 **monitor** and accept from broadcast bus 135 a leading string of data words of a message segment and store them in. . . message is a (a) CONS segment, then the segment is passed to message queue 50-5 via bus 50-6; or (b) **connectionless** message segment, then the segment is passed to routing manager circuit 50-7 via bus 50-8.
=>

=> d 11 date kwic

L21: 11 of 16

TITLE: Apparatus for coupling printer with LAN to control printer operation by transferring control parameters, printer status data and printer configuration data between printer and LAN

US PAT NO: 5,537,626 DATE ISSUED: Jul. 16, 1996
[IMAGE AVAILABLE]

APPL-NO: 08/387,626 DATE FILED: Feb. 13, 1995

REL-US-DATA: Continuation of Ser. No. 978,523, Nov. 18, 1992, abandoned.

SUMMARY:

BSUM(14)

Preferably, the peripheral is a **printer** coupled to the circuit board through an SCSI interface having a data channel for carrying print data, and a **status** channel for carrying **status** **requests** and **status** data.

DETDESC:

DETD(20)

While . . . 40 is coupled to a backbone 50 over a bus 52. The backbone 50 is nothing more than an electrical **connection** between a plurality of buses. Also connected to the WAN is a second LAN 61 comprising server S2 60, PC's. . .

DETDESC:

DETD(23)

FIG. 3 is a block diagram depicting the **connection** of the NEB 2, according to the present invention, with the printer 4 and the LAN 6. The NEB 2. . .

DETDESC:

DETD(32)

FIG. . . . 6 through network connectors 202, 203, and 204. Preferably, the connector 202 is an RJ45 capable of accepting a 10Base-T **connection**. The connector 203 may comprise a DB15 connector for accepting a 10Base-5 **connection**, while the connector 204 may be a simple Coax connector capable of accepting a 10Base-2 **connection**. All of the connectors 202, 203, and 204 are coupled to a network controller 206 (preferably an Ethernet Network Controller).. . .

DETDESC:

DETD(35)

The . . . support features for administration and management of large, multi-area networks. These support features include, for example,

printer control and status **monitoring** from a remote location on the network, (i.e., from the network administrator's office), automatic management of printer configuration after each. . .

DETDESC:

DETD(45)

In . . . can connect to more than one LAN by using up to four network interface cards (preferably Ethernet or Token Ring **connections**). In these configurations, "bridging" or "backbone" services are provided between a plurality of LANs, as shown in FIG. 2, such that resources, including printers, can be shared "**internet**" i.e., from one LAN to another.

DETDESC:

DETD(55)

. . .

NEB-to-Network
CPSOCKET (30 KB)
Concurrent multi-
communication in protocol operation
NEB EPROM
NEB Environment in (15 KB)
Monitor, loader,
NEB EPROM POST, etc.
Extensions to
CPCONSOL.EXE Remote Control &
NetWare .RTM. (180 KB)
Stats, Auto-
PCONSOLE. . .

DETDESC:

DETD(57)

The . . . The NEB-embedded software comprises a plurality of application modules (CPSERVER, CRPRINTER, etc.), real-time service modules, network protocol stacks, and a **MONITOR** program which performs application switching, process extension, device semaphores, and shares buffer-pool management. The functionality of the NEB is determined. . . software that are configured into the NEB 2. Interaction between the printer 4 and the network is coordinated by the **MONITOR** program which responds to real-time events while allocating NEB processing time to each application module on a multi-tasking basis.

DETDESC:

DETD(59)

The soft-time layer is arbited and controlled by the **MONITOR** program (to be discussed in section 41 below) which gets control of the NEB microprocessor 216 after all real-time events. . .

DETDESC:

DETD(63)

As . . . the NEB to act with either PSERVER or RPRINTER functionality on the network. The customized NEB-embedded software which permits peripheral **status** and control information over the LAN is CPSOCKET (to be discussed in section 4j below). CPSOCKET runs on the NEB and **monitors** the LAN for communications addressed to both the NEB 2 and the attached **printer** 4. Further, CPSOCKET communicates with CPINIT and CPCONSOL when they are running. CPSOCKET will maintain a table of default settings. . . . responsible for the configuration of the NEB 2. Further, CPSOCKET will configure and activate applications on the NEB at the **request** of CPINIT. CPSOCKET also insures that the correct protocol stacks are available for each configured application. CPSOCKET will handle the settings of the NEB 2 and the **printer** variables at the **request** of both CPINIT and CPCONSOL. Finally, the download facility (e.g. the network administrator's PC 14) will contact CPSOCKET to carry. . .

DETDESC:

DETD(64)

Upon . . . software of NEB 2. CPSOCKET will receive this broadcast signal and will respond. CPINIT or CPCONSOL then establishes a special **connection** with CPSOCKET using a customized client socket. CPSOCKET will then post multiple listens and will provide client service transactions such. . .

DETDESC:

DETD(67)

To . . . in section 4i below) utility provides extensions to Novell's PCONSOLE printer utility to enable access to the powerful control and **monitoring** features of the open-architecture printer 4. For example, the following are typical status control information available to the network from. . .

DETDESC:

DETD(69)

CPCONSOL . . . is to provide extensions to the Novell PCONSOLE printer utility. The CPCONSOL extension enables access to the additional control and **monitoring** features of the open-architecture printer 4. These features will enhance print service management across the network by allowing the network. . .

DETDESC:

DETD(81)

After . . . to Step S6 where the NEB EPROM operational code reads selected configuration modules, protocol stacks, housekeeping modules, etc., (e.g., the **MONITOR** multi-tasking module, CPSOCKET, CPSERVER, etc.) from EPROM 222, and downloads the selected modules to DRAM 220. In Step S6, a. . .

DETDESC:

DETD(84)

Steps . . . "autologging" function which is carried out in the NEB by the CPSOCKET program in order to automatically and systematically provide **status** information from the **printer** to the LAN (autologging will be discussed in greater detail in section 4k below). In Step S9, if midnight has. . . not been reached the procedure advances to Step S13. However, once midnight is reached, the NEB microprocessor 216 transmits a **request** to the **printer** over the SCSI bus for the **printer** to return current **status** to the NEB. For example, the **printer** may return the cumulative number of pages printed to the NEB. In Step S11, the NEB microprocessor 216 calculates **printer** statistics such as pages per job or pages per day, the NEB having kept track of the number of jobs sent to the **printer** and the date. At Step S12, the **printer** statistics are transferred to a non-volatile memory such as the **printer**'s hard disk 114 or NVRAM 111, or the NEB's NVRAM 228. Alternatively, Steps S10, S11, S12 may be performed before. . .

DETDESC:

DETD(88)

At . . . being directed to CPSOCKET (to be discussed in greater detail in section 4j below). The SCSI interface will typically have **printer** **status** data which is to be passed to the LAN in response to a previously-received **request** for **status**. CPSOCKET is the NEB-resident TSR program that responds to such **requests** for **connection**, **requests** for data download, or **requests** for services from remote utilities. CPSOCKET gathers information from the NEB or the **printer**, as needed, **monitors** **requests** to write to the log file, **monitors** application **requests** for device **status**, and maintains job statistics, as discussed above.

DETDESC:

DETD(89)

Briefly, . . . device, comprising the steps of transferring a program from board ROM to board RAM for execution from the RAM; and **monitoring**, with the program, a board network interface to detect a network communication directed to the peripheral device. The program then commands the peripheral device to perform a function in response to the network communication, and **monitors** a board bi-directional peripheral interface to detect and store status information of the peripheral device. Finally, the program outputs the. . .

DETDESC:

DETD(92)

After . . . to Step S20 where "softtime" tasks are performed on a multi-tasking basis as controlled by a multi-tasking software program called "**MONITOR**" (to be discussed in greater detail in section 4l below). Step S20 is therefore a "background" process which runs concurrently. . .

DETDESC:

DETD(93)

More particularly, **MONITOR** is a software module downloaded from EPROM 222 to DRAM 220 in Step S6. **MONITOR** is a non-preemptive multi-tasking **monitor** which distributes the processor usage among the several application tasks which are currently active. The non-preemptive nature of the **monitor** requires that each application task periodically relinquish control so that other tasks gain the opportunity to execute. The relinquish control mechanism is implemented using a software interrupt to pass control to the **MONITOR**. At an interrupt, **MONITOR** saves the state of the current task, restores the state of another active task, and resumes (or commences) execution of. . .

DETDESC:

DETD(94)

In summary, Step S20 comprises. the step of **monitoring** a plurality of application tasks in a multi-tasking interactive network board to distribute processor resources. A memory stores a first. . . application tasks each include a relinquish command which causes the currently executing application task to periodically relinquish control to the **MONITOR**. The **MONITOR** saves the state of the relinquishing task, restores the state of the non-relinquishing task, and resumes execution of the non-relinquishing. . .

DETDESC:

DETD(101)

In . . . 5C, if it is determined that a print job is not required at Step S21, Step S26 determines whether a **status** **request** has been made over the LAN requesting the **status** of the attached **printer**. If it is determined that a **status** **request** has been received, Step S27 determines the type of **status** **request**. For example, **printer** **status** such as error codest the number of pages printed, the toner **status**, etc., may be requested.

DETDESC:

DETD(102)

At Step S28, the microprocessor 216 retrieves the requested **status** data from DRAM 220, assembles the **status** data, and sends it to the LAN through the LAN interface (to be discussed in greater detail in section 4i. . . more than simple "on/off" information may be transmitted to the LAN so as to inform the LAN of the detailed **status** of the **printer**. In a broad application, Step S28 encompasses the export of **printer** front panel **status** over the LAN, and the import of front panel control commands from the LAN. That is, the network administrator at the PC 14 may **request** and receive a display indicating all of the **printer** information included on the **printer** front panel display 116. The network administrator may then activate different **printer** front panel functions on his/her PC, and such functions will be transmitted to the **printer** where the selected control will be effected.

DETDESC:

DETD(129)

In . . . 802.3, Ethernet II, Ethernet 802.2, and Ethernet SNAP. As described more fully below in section 4e, the PRESCAN software module **monitors** network communications on LAN bus 6 to determine the frame packet type. The frame packet type, once determined by PRESCAN, . . .

DETDESC:

DETD(133)

In Step S6008 microprocessor 216 retrieves the non-preemptive multi-tasking **MONITOR** (see section 41 below) from EPROM 222 and stores it into DRAM 220 and begins executing the multi-tasking **monitor** from DRAM 220.

DETDESC:

DETD(137)

According . . . as a printer is coupled to a LAN using an interactive network board having software programs embedded therein. Preferably, the **connection** between the printer and the NEB is an SCSI interface so that large amounts of print data and status data. . . printer. The EPROM-resident firmware is downloaded to the DRAM 220 upon power-up (as discussed in section 4a above), whereby the **MONITOR** multi-tasking program executes soft-time tasks until run-time interrupts are received from either the LAN or SCSI interfaces.

DETDESC:

DETD(138)

NVRAM . . . 216 executes the programs from DRAM 220, allowing print jobs to be received from the LAN and sent to the **printer** for printing, and allowing **printer** **status** to be returned over the LAN in response to a **status** **request**.

DETDESC:

DETD(141)

The provision of a bi-directional SCSI interface between the NEB 2 and the **printer** permits a large amount of **status** information to be extracted from the **printer**, while still providing the print data to the **printer**. Further, by utilizing the bi-directional SCSI interface, the **printer** can respond to control commands issued from a remote location over the LAN. For example, the network administrator may issue a control command from his/her PC 14 that **requests** a particular print job be printed a plurality of times, with high image density, and then stapled. Such control commands. . . are sent to the NEB 2 over the LAN 6, and the NEB 2 transmits these control commands to the **printer** through the SCSI bus 102. At the same time, the actual print data is transferred from file server 30 to the NEB 2, where the print data is packaged in blocks and transferred to the **printer** over the SCSI bus 102. Preferably, the NEB 2 indicates the "start of print job" by opening

the XP data channel to the **printer**. Likewise, the NEB 2 indicates "end of print job" by closing the XP data channel to the **printer**. Therefore, the NEB 2 can provide such indications to the **printer**.

DETDESC:

DETD(152)

In . . . the software modules are loaded in the following sequence: SCSI Driver; Link Support Layer; Network Driver; Prescan; IPX/SPX; CNETX; SAPSERVER; **MONITOR**; CPSOCKET; and Print Applications (e.g CPSERVER, CRPRINTER) (see FIG. 6).

DETDESC:

DETD(153)

After . . . stored in NVRAM 228 have been downloaded to DRAM 220, the loader function will pass program execution control to the **MONITOR** multi-tasking program at Step S8009.

DETDESC:

DETD(158)

The . . . NEB 2 to automatically determine the frame packet type currently being used for LAN communication on the LAN bus by **monitoring** broadcast communications on the LAN bus until the proper frame packet type is recognized. PRESCAN makes this determination based on. . .

DETDESC:

DETD(161)

PRESCAN operates by **monitoring** the LAN communication in accordance with each of the different packet types until the common area (such as IPX header. . .

DETDESC:

DETD(164)

In Step S1003, the network driver **monitors** communications on the LAN bus for broadcast traffic. Broadcast traffic means that the destination MAC address 412 is unspecified or is given a global specification of "FFFFFFFFFFFF" (hexadecimal). The network driver continues to **monitor** communications on the LAN bus for broadcast traffic (Step S1004) until broadcast traffic is received, whereupon flow advances to Step. . .

DETDESC:

DETD(173)

In . . . types corresponding to a first operating system protocol, such as SPX/IPX operating protocol for Novell-compatible operating systems. Network driver 322 **monitors** the LAN communication bus to capture broadcast traffic for the first operating system. In response to

. capturing such broadcast traffic,. . .

DETDESC:

DETD(174)

To . . . packet types corresponding to the second operating system protocol, such as TCP/IP for a UNIX operating system. The network driver **monitors** the LAN communication bus to capture broadcast traffic for the second operating system, and provides plural data groups corresponding to. . .

DETDESC:

DETD(180)

As . . . non-fileserver network node to advertise its services on the LAN bus. However, in the multi-tasking environment established by the non-preemptive **MONITOR**, NEB 2 provides more than one network server. In particular, NEB 2 provides the services of the print server (CPSERVER,. . .

DETDESC:

DETD(188)

In Step S1309, the broadcast requester establishes direct SPX **connection** with the client designated in the broadcast request over the communication socket designated in Step S1308. In the present configuration,. . . when requests for services of the CPSOCKET server is requested, the socket number is 83B4 for communication and 83B5 for **connection**. Direct communication then proceeds as described more fully hereinbelow.

DETDESC:

DETD(201)

The . . . the total number of pages printed, as well as the average page-per-minute rate, average pages-per-day, and other statistics that allow **monitoring** of the operating efficiency of the printer.

DETDESC:

DETD(204)

By ongoing **monitoring** CPCONSOL can help determine whether to relocate or add network printers for better efficiency as well as forecast the need. . .

DETDESC:

DETD(219)

. . .
packets missed due
to lack of space in the
receive buffer, or the
controller is in the **monitor**

mode.

Align Errors — Indicates that the incoming packet did not end on a byte boundary.

Received Disabled — Controller was in the **monitor** mode.

Deferring — Set when internal Carrier Sense or Collision signals are generated in the encoder/decoder.

Overflow — Buffer. . .

DETDESC:

DETD(232)

This menu allows CPCONSOL to display the current **status** of the **printer** attached to the NEB (Step S1518), and to modify and store the new **printer** **status** (Step S1519). CPCONSOL directs a **status** **request** to the targeted NEB via the LAN interface. At the targeted NEB, CPSOCKET receives the **status** **request** and sends a **request** for the needed **status** information to the **printer** via the bi-directional SCSI interface. CPSOCKET receives the **status** information from the **printer** over the bi-directional SCSI interface and directs the information back to CPCONSOL where it is displayed on the system administrator's. . .

DETDESC:

DETD(236)

CPSOCKET . . . program which runs out of DRAM 220 on the NEB 2 in the multi-tasking soft-time environment provided by the non-preemptive **MONITOR**. CPSOCKET causes SAPSERVER to **monitor** the NEB's broadcast socket on the LAN for broadcasts from client programs such as CPINIT, CPCONSOL and DOWNLOADER.

DETDESC:

DETD(238)

CPSOCKET . . . the device environment (that is, a guaranteed safe environment, see section 4m below), downloads the basic configuration information for the **printer** and for the NEB (for example, fonts and emulations) at device power-up (see section 4d above), provides device **status** information, statistics, and log information in response to CPCONSOL **requests**, and provides reset, re-boot, and firmware download capabilities.

DETDESC:

DETD(240)

In . . . NEB commences execution of the CPSOCKET from DRAM 220. CPSOCKET is executed in a multi-tasking soft-time environment by the non-preemptive **MONITOR** which permits non-preemptive execution of other application programs such as CPSERVER without letting one

application program seize control of the. . .

DETDESC:

DETD(243)

In . . . with CPSOCKET over a socket number that is pre-assigned to CPSOCKET, here socket number 83B4 for communication or 83B5 for **connection**. In accordance with that direct **connection**, CPSOCKET receives and interprets client **requests** and/or commands that are received over the LAN interface, **monitors** the **status** of the **printer** over the bi-directional SCSI interface, receives and sends **status** commands and/or inquiries to the **printer** via the bi-directional SCSI interface, reconfigures the NEB and the NEB configuration parameters, and sends requested information to the client via the LAN interface. These steps are described more fully below in **connection** with Steps S1607 through S1620 of FIGS. 16A and 16B.

DETDESC:

DETD(247)

TABLE 10

Device Information Commands

Command	Data (CPCONSOL .fwdarw. CPSOCKET)	Response (CPSOCKET .fwdarw. CPCONSOL)
request for interface **status**	none	interface **status**
request for control **status**	none	**printer** control information for CPCONSOL "control" menu
request for font **status**	none	**printer** font set
request for layout **status**	none	**printer** layout (portrait/landscape, etc.)
request for quality and common environment **status**	none	**printer** macros
request for duplex **status**	none	**printer** duplex mode
request for miscellaneous	none	miscellaneous **printer** info

```
                                (collation,
                               stapling, paper
                               folding, paper
                               trays, etc.)
**request** for
          none                 default **printer**
default                        control
control                        information for
**status**                         CPCONSOL
                               "control" menu

**request** for
          none                 default **printer**
default font                   font set
**status**
**request** for
          none                 default **printer**
default                        layout (portrait/
layout **status**                  landscape, etc.)
**request** for
          none                 default **printer**
default                        macros
quality and
common
environment
**status**
**request** for
          none                 default **printer**
default                        duplex mode
duplex **status**
**request** for
          none                 default
default                        miscellaneous
miscellaneous                  **printer** info
**printer** info                   (collation,
                               stapling, paper
                               folding, paper
                               trays, etc.)
set control
          new **printer**          confirmation
          control
          information for
          CPCONSOL "control"
          menu
set font  new **printer** layout
                                confirmation
          (portrait/landscap
          e, etc.)
set quality
          new **printer** macros
                                confirmation
and common
environment
set duplex
          new **printer** duplex
                                confirmation
          mode
set       new miscellaneous
                                confirmation
```

miscellaneous	**printer** info		
printer info	(collation, stapling, paper hold, paper trays, etc.)		
set default	default **printer**	confirmation	
control	control information for CPCONSOL "control" menu		
set default	default **printer**	confirmation	
layout	layout (portrait/ landscape, etc.)		
set default	default **printer**	confirmation	
quality and	macros		
common environment			
set default	default **printer**	confirmation	
duplex	duplex mode		
set default	default	confirmation	
miscellaneous	miscellaneous		
printer info	**printer** info (collation, stapling, paper holding, paper trays, etc.)		

DETDESC:

DETD(252)

If . . . the bi-directional SCSI interface to obtain needed printer statistics. The statistics correspond to the network group displays described above in **connection** with CPCONSOL, as well as to print job statistics such as the total number of pages printed, the total number. . . . of jobs, the total number of off-line time, etc. The job statistics correspond to the logging group described above in **connection** with the CPCONSOL program. Specific examples of the commands executed in the NEB/printer statistics commands are set forth in Table. . .

DETDESC:

DETD(261)

The . . . a later time. The statistics can be used to anticipate replacement of consumable printer supplies, such as toner, and to **monitor** user behavior such as leaving the printer off-line for

extended periods of time.

DETDESC:

DETD(270)

The . . . discussed above are quite significant in making the printer an interactive and responsive member of the LAN since the SCSI **connection** between the NEB and the printer is capable of extracting volumes of specific data from the printer.

DETDESC:

DETD(272)

As briefly described earlier with respect to Step S20 of FIG. 5B, the NEB EPROM 222 stores a **MONITOR** program which is a mechanism which supports multi-tasking in the run-time environment while permitting synchronous operation in a de-bug environment. **MONITOR** permits currently-called tasks to be performed on a non-preemptive basis while the NEB awaits real-time interrupts from either the LAN (for CPSERVER or CPSOCKET) or through the SCSI interface (e.g., when **status** information is being provided from the **printer** to the NEB in response to a previously-received **status** **request** from the LAN). Thus, **MONITOR** permits all currently-executing tasks to be performed simultaneously by sharing use of the microprocessor 216. Of course, all soft-time applications, including **MONITOR** itself, are interruptable by real-time events.

DETDESC:

DETD(273)

FIG. . . . order to illustrate the multi-tasking operation within the NEB. At Step S1, power is applied to the NEB, and the **MONITOR** program is downloaded from EPROM 222 to DRAM 220 in Step S1801. For example, the following modules are downloaded together with **MONITOR**: SCSI Driver; Link Support Layer; Network Driver; Prescan; IPX/SPX; Customized NETX; SAPSERVER; CPSOCKET; and Print Applications (see FIG. 6).

DETDESC:

DETD(274)

If, . . . relinquish interrupt has been reached at Step S1803, execution of the currently-executing module is stopped and control is returned to **MONITOR** at Step S1804. **MONITOR** saves the state of the interrupted task in DRAM 220. However, if the relinquish interrupt has not been reached at. . .

DETDESC:

DETD(275)

If . . . the execution of another software module, e.g., where data is received over the SCSI interface in response to a previously-issued **request** for **printer** **status**. If it is determined in Step S1806 that such data has been received, Step S1807 begins execution of another

application. . .

DETDESC:

DETD(276)

At . . . second application module. If such an interrupt has been reached, the second application will stop execution and pass control to **MONITOR** which stores in DRAM 220 the state of the just-interrupted second module at Step S1809. However, if the relinquish interrupt. . . S1803. If both the first and second modules have reached their end at Step S1811, control will return to the **MONITOR** program in order to execute other newly-received soft-time tasks.

DETDESC:

DETD(277)

After the second application module has stopped executing due to reaching a relinquish interrupt therein, control is passed to **MONITOR** which, after storing the state of the interrupted module in DRAM 220 (Step S1809), will recommence execution of the first. . .

DETDESC:

DETD(339)

The NEB 2 is coupled to a test driver PC2 306 through an SCSI bus 308 and Ethernet LAN **connections** 310, 312. The PC2 306 includes an SCSI board 314.and a network controller board 316 so that it may simulate. .

DETDESC:

DETD(344)

Some . . . may require NEB 2 to communicate with PC2 306 over either the SCSI bus 308 or one of the LAN **connections** 310, 312. For instance, in accordance with the test program, NEB 2 may request data from PC2 over the LAN **connection** 310. PC2 306 is configured to return appropriate responses to each communication from NEB 2, thereby effectively emulating the printer. . .

CLAIMS:

CLMS(1)

What is claimed is:

1. Apparatus for interfacing a **printer** with a computerized local area network (LAN), said apparatus comprising:
a circuit board couplable to the **printer** and to the LAN;
a bi-directional interface, disposed on said circuit board, for transmitting print data to the **printer**, for transmitting control parameters to the **printer**, for transmitting **printer** **status** **requests** and **printer** configuration **requests** to the **printer**, and for receiving **printer** **status** data and **printer** configuration data from the **printer** in response to the

printer **status** **requests** and the **printer** configuration **requests**, respectively, the **printer** **status** data being generated by the **printer** and comprising a current operational state of the **printer**, and the **printer** configuration data being stored in the **printer** and being used to configure the **printer** for operation;

a RAM, disposed on said circuit board, for storing the print data, the **printer** **status** data, the **printer** configuration data, and a plurality of application programs;

a LAN interface, disposed on said circuit board, for receiving the print data, the control parameters, the **printer** **status** **requests**, and the **printer** configuration **requests** from the LAN, and for transmitting the **printer** **status** data and the **printer** configuration data to the LAN; and

a processor, disposed on said circuit board, for executing the plurality of application programs on. . . (a) the print data to be received from the LAN over the LAN interface and to be transmitted to the **printer** over the bi-directional interface, (b) the control parameters to be transmitted to the **printer** over the bi-directional interface, (c) the **printer** **status** **requests** and the **printer** configuration **requests** to be received from the LAN over the LAN interface and to be transmitted to the **printer** over the bi-directional interface, (d) the **printer** **status** data and the **printer** configuration data to be received from the **printer** over the bi-directional interface in response to the **printer** **status** **requests** and the **printer** configuration **requests**, respectively, and (e) the **printer** **status** data and the **printer** configuration data to be transmitted to the LAN over the LAN interface.

CLAIMS:

CLMS(8)

8. . . . to claim 1, wherein said bi-directional interface is comprised of a data channel for transmitting said print data to the **printer**, and a **status** channel for transmitting the **printer** **status** **requests** and the **printer** configuration **requests** to the **printer** and for receiving the **printer** **status** data and the **printer** configuration data from the **printer** in response to the **printer** **status** **requests** and the **printer** configuration **requests**, respectively.

CLAIMS:

CLMS(28)

28. Apparatus for interfacing a **printer** with a local area network (LAN), said apparatus comprising:

a circuit board couplable to the **printer**;

a bi-directional interface, disposed on said circuit board, for transmitting **printer** control parameters to the **printer**, for transmitting **printer** **status** **requests** and **printer** configuration **requests** to the **printer**, and for receiving **printer** **status** data and **printer** configuration data from the **printer** in response to the **printer** **status** **requests** and the **printer** configuration **requests**, respectively, the **printer** **status** data being generated by the **printer** and

comprising a current operational state of the **printer**, and the **printer** configuration data being stored in the **printer** and being used to configure the **printer** for operation;

a RAM, disposed on said circuit board, for storing the control parameters, the **printer** **status** data, the **printer** configuration data, and at least one application program;

a LAN interface, disposed on said circuit board, for receiving the control parameters from the LAN, for receiving the **printer** **status** **requests** and the **printer** configuration **requests** from the LAN, and for transmitting the **printer** **status** data and the **printer** configuration data to the LAN; and

a processor, disposed on said circuit board, for executing, on a multi-tasking basis, the at least one application program stored in said RAM to cause the control parameters to be transmitted to the **printer** and to cause the **printer** **status** data and the **printer** configuration data received via the bi-directional interface to be transmitted to the LAN wherein said bi-directional interface is comprised by a data channel for transmitting print data to the **printer**, and a **status** channel for transmitting the **printer** **status** **requests** and the **printer** configuration **requests** to the **printer** and for receiving the **printer** **status** data and the **printer** configuration data from the **printer**.

CLAIMS:

CLMS(32)

32. A system comprising:

a **printer**; and

an apparatus for interfacing the **printer** with a computerized local area network (LAN), said apparatus comprising:

a circuit board couplable to the **printer** and to the LAN;

a bi-directional interface, disposed on said circuit board, for transmitting print data to the **printer**, for transmitting control parameters to the **printer**, for transmitting **printer** **status** **requests** and **printer** configuration **requests** to the **printer**, and for receiving **printer** **status** data and **printer** configuration data from the **printer** in response to the **printer** **status** **requests** and the **printer** configuration **requests**, respectively, the **printer** **status** data being generated by the **printer** and comprising a current operational state of the **printer**, and the **printer** configuration data being stored in the **printer** and being used to configure the **printer** for operation;

a RAM, disposed on said circuit board, for storing the print data, the **printer** **status** data, the **printer** configuration data, and a plurality of application programs;

a LAN interface, disposed on said circuit board, for receiving the print data, the control parameters, the **printer** **status** **requests**, and the **printer** configuration **requests** from the LAN, and for transmitting the **printer** **status** data and the **printer** configuration data to the LAN; and

a processor, disposed on said circuit board, for executing the plurality of application programs on. . . (a) the print data to be received from the LAN over the LAN interface and to be transmitted to the **printer** over the bi-directional interface, (b) the control parameters to be transmitted to the **printer** over the

bi-directional interface, (c) the **printer** **status** **requests** and the **printer** configuration **requests** to be received from the LAN over the LAN interface and to be transmitted to the **printer** over the bi-directional interface, (d) the **printer** **status** data and the **printer** configuration data to be received from the **printer** over the bi-directional interface in response to the **printer** **status** **requests** and the **printer** configuration **requests**, respectively, and (e) the **printer** **status** data and the **printer** configuration data to be transmitted to the LAN over the LAN interface.

CLAIMS:

CLMS(33)

33. A system comprising:
a **printer**; and
an apparatus for interfacing the **printer** with a local area network (LAN), said apparatus comprising:
a circuit board couplable to the **printer**;
a bi-directional interface, disposed on said circuit board, for transmitting **printer** control parameters to the **printer**, for transmitting **printer** **status** **requests** and **printer** configuration **requests** to the **printer**, and for receiving **printer** **status** data and **printer** configuration data from the **printer** in response to the **printer** **status** **requests** and the **printer** configuration **requests**, respectively, the **printer** **status** data being generated by the **printer** and comprising a current operational state of the **printer**, and the **printer** configuration data being stored in the **printer** and being used to configure the **printer** for operation;
a RAM, disposed on said circuit board, for storing the control parameters, the **printer** **status** data, the **printer** configuration data, and at least one application program;
a LAN interface, disposed on said circuit board, for receiving the control parameters from the LAN, for receiving the **printer** **status** **requests** and the **printer** configuration **requests** from the LAN, and for transmitting the **printer** **status** data and the **printer** configuration data to the LAN; and
a processor, disposed on said circuit board, for executing, on a multi-tasking basis, the at least one application program stored in said RAM to cause the control parameters to be transmitted to the **printer** and to cause the **printer** **status** data and the **printer** configuration data received via the bi-directional interface to be transmitted to the LAN wherein said bi-directional interface is comprises by a data channel for transmitting print data to the **printer**, and a **status** channel for transmitting the **printer** **status** **requests** and the **printer** configuration **requests** to the **printer** and for receiving the **printer** **status** data and the **printer** configuration data from the **printer**.

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